PART I: DIRECTION FOR BUSINESS AREAS

Part I of this *2007 Water System Plan* presents SPU's water system capital facilities and operation and maintenance "roadmap" for the next 20 years and beyond. After an introductory chapter to establish context for this updated plan, the balance of Part I presents the substance of that "roadmap" for each business area of SPU's water line of business. Part II focuses on the anticipated costs of implementing that roadmap over the next six years and through 2030.

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Chapter 1
Introduction

Seattle Public Utilities (SPU) provides drinking water to a service area population of 1.45 million within the greater Seattle metropolitan region of King County and small portions of southwest Snohomish County.

As part of its continuing effort to meet or exceed all drinking water regulations, and in response to input SPU has sought from its retail and wholesale customers regarding the need for reliable, high-quality, and affordable water service, SPU has prepared this *2007 Water System Plan* in accordance with Washington State Department of Health (WDOH) requirements. This introductory chapter includes a brief history and description of the existing water system and of the four business areas that comprise SPU's water line of business to provide context for this plan.

In addition, this chapter presents an overview of SPU's asset management business framework, which guides how SPU conducts business. The chapter also contains a description of the current planning environment, including changes as a result of the Municipal Water Law adopted by the Washington State Legislature, other regional planning efforts in SPU's service area, and the potential impacts of future climate change on SPU's water system and its customers. Finally, the introduction summarizes the organization of this plan and describes how it meets the requirements of the Washington Administrative Code (WAC).

1.1 Introduction to Drinking Water Line of Business

The mission of SPU's water line of business is to provide reliable, high-quality water for people and fish.

In addition to operating Seattle's regional drinking water system, SPU also provides surface water drainage, wastewater, solid waste, and engineering services to residents of Seattle. This plan covers SPU's drinking water line of business. This section provides background on the water system and the water utility's organizational structure.

1.1.1 History of Water Business

Since 1901, the Cedar River has provided water for Seattle. Initially, there was a diversion dam and transmission pipeline on the lower Cedar River at Landsburg and a timber crib dam at Cedar

Lake–later renamed Chester Morse Lake. In 1914, a higher masonry dam was constructed to create storage for Seattle's water supply. Additional pipelines were added between 1909 and 1954 to meet growing demands for water. Today the Cedar River supplies about 70 percent of SPU's customer demand for water.

In the late 1950s, several King County suburban communities began to look to Seattle as a source of their drinking water. In response, Seattle began selling water wholesale to these communities, who, in turn, supply it to their own customers.

In 1936, the City began developing its water rights on the Tolt River and first put the source to use in 1964. The first phase of the Tolt development was on the South Fork Tolt River, where a reservoir and pipelines were built to increase Seattle's water supply. The South Fork Tolt now provides approximately 30 percent of the City's water supply.

In 1987, the City began development of two well fields near the Highline area, subsequently renamed the "Seattle Well Fields". These well fields are available to supplement Seattle's surface water supplies, especially during the summer peak demand season and emergencies.

1.1.2 System Description

The Cedar River supplies about 70 percent of SPU's customer demand for water, and the South Fork Tolt River supplies about 30 percent.

Today, SPU's regional water system is the largest in Washington State. SPU serves more than 628,000 people in its retail service area and provides water to 21 wholesale customers, who together deliver water to an additional population of over 850,000. The water from the Cedar and South Fork Tolt Rivers is treated by ozonation/ultraviolet light and ozonation/filtration respectively. The Seattle Well Fields are available to supplement the South Fork Tolt and Cedar supply sources during peak demand seasons and during emergencies. SPU's water is delivered to Seattle retail service connections and to SPU wholesale customers through a network of approximately 1,800 miles of transmission and distribution system pipelines. Figure 1-1 shows the major components of the Seattle Regional Water Supply System and the areas currently served by SPU and its wholesale customers.

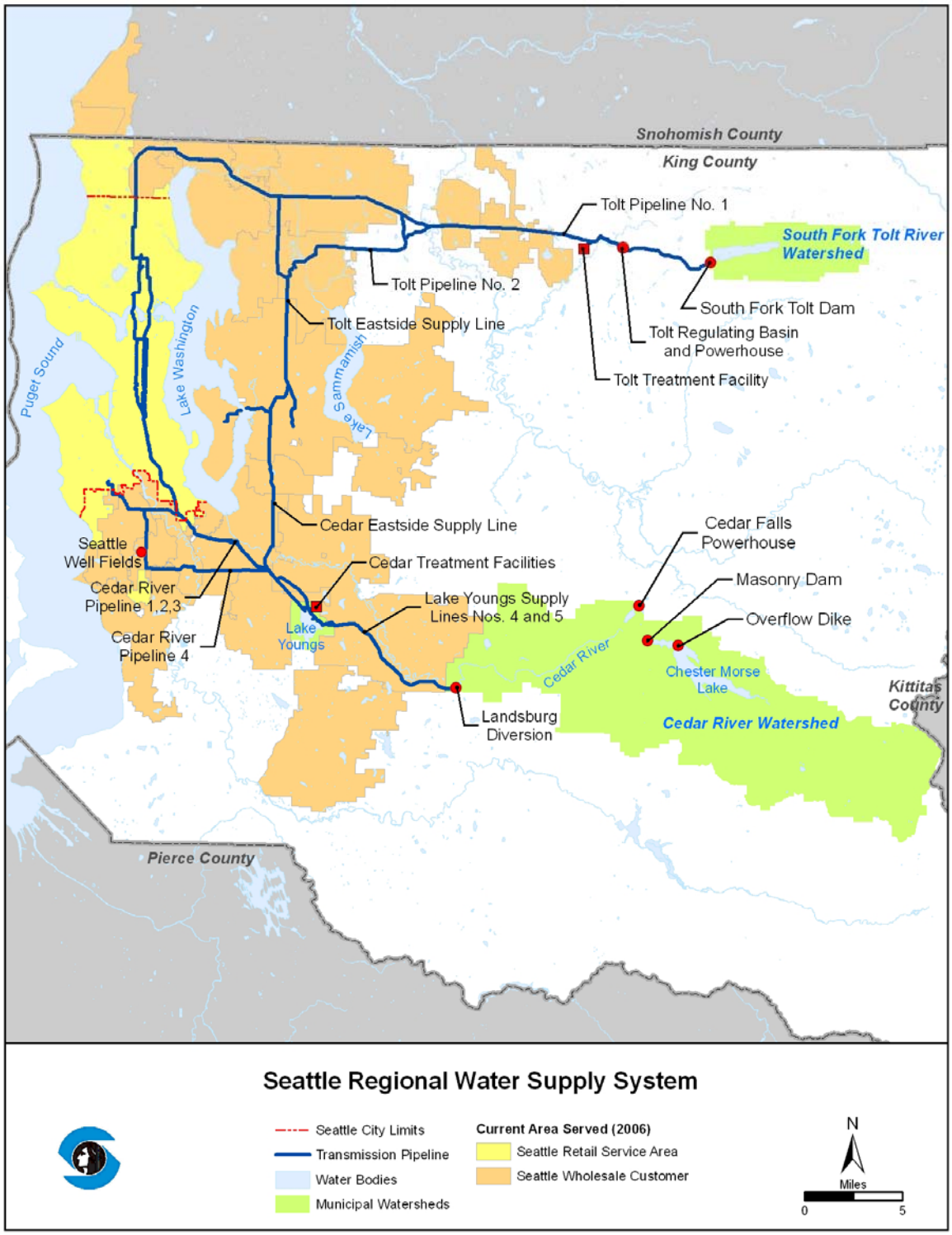

Figure 1-1. Seattle Regional Water Supply System

Since SPU's last *Water System Plan* in 2001, the water utility has added transmission pipelines to provide additional system redundancy and has begun operation of two new source treatment facilities, one for the Cedar supply and one on the South Fork Tolt supply, to meet regulatory requirements, increase reliability and yield, and improve the aesthetic qualities of the water. SPU has also completed new fish ladder and fish passage facilities at the Landsburg diversion dam to restore the historical Chinook and Coho salmon runs to the reach of the Cedar River and tributaries above the dam. In addition, SPU has been actively pursuing its open reservoir covering/replacement program to help maintain the high quality of the treated water that SPU provides.

1.1.3 Business Areas

SPU's water line of business is divided into four business areas: Major Watersheds, Water Resources, Water Quality and Treatment, and Transmission and Distribution.

SPU's water line of business is divided into four business areas that are focused on key components or sub-systems of its water system. By organizing the line of business in this way, SPU is better able to articulate the performance objectives of each sub-system and create accountability in meeting those objectives. These business areas include major watersheds, water resources, water quality and treatment, and transmission and distribution. The mission statement for the water line of business is to provide reliable, high quality water for people and fish.

Major Watersheds Business Area

The Major Watersheds business area covers watershed management of the South Fork Tolt and Cedar River Municipal Watersheds and Lake Youngs Reservation. Activities are conducted to ensure that source water quality and environmental stewardship goals are met. In addition, the Major Watersheds business area includes planning and oversight for watershed land management plans, Cedar River Watershed Habitat Conservation Plan (CRW HCP), Bonneville Power Administration (BPA) settlement agreement implementation, Muckleshoot Indian Tribe agreement implementation, watershed stewardship (including Cedar River Education Center), watershed bridges and roads, watershed protection plans, cultural resources management plans, and other programs and projects involving the watersheds for the surface water supplies. Except for watershed programs and plans to protect drinking water quality (covered in Chapter 3, Water Quality and Treatment), the activities of the Major Watersheds business area are not summarized as part of this *2007 Water System Plan* since such a summary is not required by WDOH.

Water Resources Business Area

The Water Resources business area consists of the programs and projects whose purpose is to plan for and ensure sufficient water is available to meet anticipated demands. One critical function of this business area is real-time management and operation of mountain reservoir and river facilities for water supply, instream resource protection, and flood management, as well as hydropower generation. The programs of the Water Resources business area include instream resource management, water conservation, dam safety, and water rights. The Water Resources business area also performs water supply and demand forecasting, conservation potential assessments, reclaimed water/water reuse analysis, development of new sources of supply when needed, and infrastructure planning for water supplies.

Water Quality and Treatment Business Area

The Water Quality and Treatment business area covers SPU's drinking water quality and treatment programs, projects, services, and capital assets from the source to customer taps. Key functions of this business area include managing SPU's drinking water regulatory compliance, oversight of the Tolt and Cedar water treatment facilities and their contract operations, and overseeing water quality and treatment programs and capital projects. Key water quality monitoring and regulatory compliance services are provided to the Water Quality and Treatment business area by SPU Laboratory Services Division through an internal service agreement. Infrastructure in this business area includes the Tolt and Cedar Treatment Facilities and ancillary facilities, Landsburg treatment and intake screening facilities, and in-town water treatment facilities at reservoirs and well sites. Programs in the Water Resources business area include cross-connection control, storage facility washing, and water main flushing.

Transmission and Distribution Business Area

The Transmission and Distribution business area is comprised of programs and projects affecting the regional and sub-regional transmission systems, which serve both retail and wholesale customers, and the distribution system, which serves only SPU's own retail customers. Business area activities include policy development, planning and oversight for transmission and distribution pipelines, and operation and maintenance of the transmission and distribution pipelines, storage facilities, pump stations, and appurtenances. The Transmission and Distribution

business area provides oversight for and coordination with related programs, such as seismic analysis and cathodic protection.

1.2 CORPORATE POLICIES THAT SHAPE HOW SPU DOES BUSINESS

Over the past few years, SPU has been developing and implementing a number of new policies to guide the overall utility operation. SPU has committed itself to using an asset management approach in its decision-making. SPU has also explicitly increased its commitment to environmental stewardship. In addition, SPU has become increasingly aware of the critical need to keep drinking water systems and facilities, and the people who operate them, safe and secure and to ensure that emergency preparedness is a top priority. Finally, since customer service is a key component of how decisions are made in an asset management environment, SPU has committed itself to better communication with its customers to increase its understanding of and its ability to meet their water service needs and expectations. The subsections below summarize new policies that SPU developed in light of each of these commitments. The policies reflect the overall direction for the utility as they apply to the water line of business.

1.2.1 Asset Management Policy

SPU implements "asset management" – an approach to meeting customer service levels at the lowest life-cycle cost.

Since last updating its water system plan, SPU has taken a new approach to planning, maintaining, and investing in its facilities by implementing an approach known as "asset management." Asset management is an approach to meeting agreed service levels while minimizing life-cycle costs. This approach to making decisions regarding capital projects and operations and maintenance (O&M) work is based on a long-term view of financial, social, and environmental costs and benefits, otherwise known as the "triple bottom line". Asset management provides the highest long-term value to ratepayers while minimizing life-cycle cost.

SPU is committed to enhancing its capacity to inform the public, interest groups, and decision-makers of policy choices and their trade-offs. SPU embraces the "asset management" framework as a way to define, evaluate and debate the financial, social, and environmental factors from various perspectives before making major project and program investment decisions. Asset management, and the rigor that it offers, provides a transparent and deliberate decision-making process.

This policy articulates the utility's commitment to asset management as it affects how the utility conducts business and makes decisions in providing high-quality, reliable drinking water for the citizens and businesses of the region for many generations to come.

Policy Statement

Use Asset Management principles to guide all capital and O&M financial decisions to deliver services effectively and efficiently.

1. *Match SPU service levels with customer expectations, and adjust as customer needs change.*
2. *Use the most current methodologies for triple-bottom-line analysis to ensure financial, social, and environmental life-cycle costs, risks and benefits are adequately reflected in capital and O&M decisions.*
3. *Support a transparent and thorough process for considering projects and programs.*
4. *Manage risk by assessing, quantifying in decision making and reviewing alternatives.*
5. *Collect and utilize accurate and timely data which is key to decision-making.*
6. *Continue to seek guidance from world leaders in Asset Management, as well as conduct benchmarking exercises to learn more about best practices and potential organizational improvement.*

1.2.2 Environmental Stewardship Policy

SPU is dedicated to being a leader in its protection of the environment.

SPU is committed to protecting and enhancing the environment while implementing utility projects, operations, and programs. Over time this commitment has become more prominent in SPU as the environmental ethic of the region has grown stronger. This policy continues SPU's dedication to be a utility leader in protecting the environment as it provides high-quality, reliable drinking water. It is adapted from an SPU policy and procedure developed for guiding all utility business.

Policy Statement

Protect and enhance the environment affected by the utility while meeting SPU's responsibilities to provide drinking water.

1. *Achieve or exceed the goals and expected outcomes of environmental laws.*
2. *Manage capital and O&M activities, at a minimum, to first avoid, and otherwise minimize, negative effects to the environment.*
3. *Conduct triple-bottom-line assessment and apply other asset management principles in making decisions about capital and O&M activities aimed at implementing this policy.*
4. *Reflect public and stakeholder interests on key environmental issues in SPU service levels and actions.*
5. *Revise environmental targets and objectives periodically, which include the development of proposed future conditions for important environmental assets, based on scientific learning and practical experience acquired from monitoring environmental performance.*
6. *Reduce the quantity and toxicity of materials used and waste generated from SPU facilities and operations through source reduction, reuse, or recycling.*
7. *Promote and support the efficient use of materials and resources in all phases of a facility's life.*
8. *Promote environmental equity[1] through utility operations and programs.*
9. *Assess and manage environmental risks as expressed in SPU's corporate risk and financial management strategies and decision-making processes.*
10. *Lead and work cooperatively with other organizations to promote common regional environmental goals and objectives.*

[1] Environmental equity refers to the equitable distribution of environmental costs and benefits geographically across the service area and among various demographic groups.

1.2.3 Security and Emergency Preparedness Policy

SPU continues to increase security measures at its facilities to protect utility operations and maintain water delivery even in the event of an emergency.

SPU has substantially increased security measures to protect utility operations and maintain business continuity. SPU has conducted vulnerability assessments and developed policies to address the three elements of security - operational, physical, and information technology. SPU has also been implementing security improvements at its facilities and has been increasing system monitoring. In addition, SPU has been developing and implementing procedures for an integrated security system that enhances the protection of the entire water system and increases the protection of SPU employees, visitors, and citizens.

In the event that a portion of the water system infrastructure is damaged as the result of a natural or human-caused disaster, SPU has developed an enhanced emergency preparedness program to improve its ability to continue to provide drinking water. This policy is based on SPU's 2003 Charter Security Policy and the detailed security policies that have been developed to guide all utility business at SPU.

Policy Statement

Institute and maintain appropriate safeguards to protect against security risks and sustain emergency response readiness to ensure the continuity of drinking water services, including fire protection service.

1. *Establish a culture where the safety and security of persons, drinking water services, and water system infrastructure, as well as emergency preparedness, are top priorities.*
    a. *Prepare for rapid and effective response to emergencies, whether man-made or natural, accidental or intentional.*
    b. *Provide a safe work environment for employees, contractors, customers, and visitors by incorporating security measures designed to protect people, assets, the environment, and operations against the threat of injury, loss, or damage by criminal, hostile, or malicious acts, including terrorism.*
2. *Maintain an ongoing capability to assess and manage security threats within the limitations of an event or situation.*
3. *Coordinate security policies and programs with other city departments, SPU stakeholders, and other appropriate agencies.*

4. *Incorporate security measures in the development of new and existing SPU water system projects and operations that are positively valued for cost and risk.*

1.2.4 Meeting Customers Expectations Policy

SPU proactively seeks customer input to help determine the service levels that it provides to its customers.

As SPU has embraced asset management, it continues to focus on shaping departmental services to match the needs of both retail and wholesale customers. By fostering better communication with customers and soliciting their input, SPU can more accurately determine the levels of service to provide to customers. This policy articulates how SPU aligns its drinking water services with customer needs and expectations.

Policy Statement

Provide retail and wholesale drinking water service that responds to changing customer expectations centered on providing reliable, high-quality water, and guided by asset management principles.

1. *Use retail and wholesale customer-driven service levels to guide SPU's decisions regarding the drinking water services the department provides.*
    a. *Set service levels that are within SPU control based on high priorities to customers or regulatory requirements.*
    b. *Collect and analyze retail and wholesale customer input through a variety of means, and modify SPU's service level targets as needed.*
2. *Provide services with efficiency and fairness across customer classes (e.g., retail/wholesale, residential/commercial), and across all affected communities.*
3. *Maintain appropriate tools and technology for enhancing customer relationships and responsiveness to customers.*
4. *Explore potential approaches to enhance retail water service beyond the customer's meter, recognizing that SPU's responsibility for water infrastructure ends at the meter.*
5. *Consider expanding fee-based services to wholesale customers and neighboring utilities.*

1.3 SPU'S ASSET MANAGEMENT BUSINESS FRAMEWORK

For SPU and its customers, asset management is a way of increasing productivity and ensuring cost-effectiveness in service delivery. Asset management is a method of meeting established service levels at the lowest life-cycle cost. Regulatory requirements are also met through asset management. SPU has a number of business procedures in place to incorporate asset management practices throughout its lines of business. These include procedures for establishing service levels, preparation of project development plans for capital projects and programs, development of strategic asset management plans for classes of assets, and benchmarking SPU's performance against other, similarly-sized, water utilities. Each of these procedures is described briefly below.

1.3.1 Service Levels

SPU measures its performance through service levels, or statements of desired performance outcomes.

Service levels are statements of desired performance outcome that are high priority to SPU's customers or required by regulators. Often these service levels go beyond minimum regulatory requirements. Service levels are largely within the control of SPU and have performance level data that can be accurately and consistently collected and audited. SPU utilizes service level objectives – broad statements of intent – to establish the direction of each of its business areas while using service level targets to establish annual or longer term goals which can be measured through performance targets. Service levels are used by SPU to manage its assets, including making decisions on renewal/ replacement and O&M practices. While the current service levels are documented in this *Water System Plan*, they may be revised as new information is gathered from customers and more data is collected on system performance and costs.

1.3.2 Project Development Plans

A project development plan (PDP) is the key document used for evaluating whether a project or expenditure is justified. PDPs are also used for making decisions on programs. The PDP documents project objectives, relevant project data, options, and alternatives, as well as the project work plan with cost estimates and milestones. The business case portion of a PDP includes an analysis of the financial, social, and environmental benefits and costs of a project, a "perspectives" analysis (i.e., who gains and who pays), and an analysis of the risks and uncertainties involved.

1.3.3 Strategic Asset Management Plans

Strategic asset management plans (SAMPs) are 3- to 5-year planning documents that guide the management of assets to meet defined objectives. Each SAMP covers a class of assets (e.g., pipelines) that represents a major investment by SPU, requires significant resources to maintain, and is important to delivering drinking water service. SAMPs describe relevant assets and service levels, establish criteria for criticality, provide profiles of the assets and known conditions, describe operations and maintenance strategies, provide replacement/renewal capital plans, describe decision tools and models, and identify relevant data that need to be collected and workflow processes that need to be implemented. SAMPs characterize SPU's risk tolerance for the class of asset and define the mitigation of risks associated with ownership and operation of those assets. SAMPs provide more detail on asset classes than a water system plan, are updated more frequently than a water system plan, and centralize information related to the asset.

Criticality is a measure of the consequence of failure of an asset.

1.3.4 Benchmarking

SPU's asset management approach makes use of benchmarking–a process whereby a utility measures its performance or process against other utilities' best practices, determines how those utilities achieved their performance levels, and uses the information to improve its own performance. Since 2003, SPU has participated in the benchmarking projects offered by the Water Services Association of Australia (WSAA). These projects allow SPU to compare its asset management processes and its asset costs and service levels with other utilities that are also world leaders in the practice of asset management.

SPU participates in benchmarking studies in which it compares its performance with that of other utilities around the world.

SPU's first benchmarking project with WSAA occurred during 2003-04 and assessed the utility's processes and systems in a variety of areas, such as business planning, asset operations and maintenance, and asset replacement and rehabilitation. In 2005, SPU participated in WSAA's civil maintenance benchmarking project, which reviewed costs and service levels for maintaining water and wastewater pipes and related assets. In 2006, SPU has begun its participation in a mechanical/electrical benchmarking project, which will produce comparative statistics on costs and service levels associated with maintenance of water and wastewater pump stations and treatment plants.

1.4 CURRENT PLANNING ENVIRONMENT

Since the last water system plan update in 2001, several changes have occurred that help shape the content of this plan. While implementation of an asset management program in itself represents a significant change, other changes include passage of Washington's new Municipal Water Law, new regional relationships, and growing concern about potential impacts of future climate change.

1.4.1 Municipal Water Law

The Municipal Water Law (MWL), passed by the Washington State Legislature in 2003, produced the most sweeping changes to water law in recent years. It provided assurances to utilities for water provision into the future, but it also imposed new requirements. The law significantly impacts the requirements of water system planning. For this reason, all the elements required to meet interim and anticipated regulatory guidelines of the MWL are included in this *2007 Water System Plan*.

Three areas of the MWL generate significant changes from the previous water system plan. The most significant change relates to service area designation. The MWL allows utilities to change the place of use of its water rights to match the utility service area when specific measures of consistency are met. SPU is requesting such a change in this water system plan for its Cedar River and Lake Youngs claims, and this plan documents how consistency requirements are being met.

Another important change is the MWL's requirement for setting a conservation goal. SPU has been a national leader in water conservation and has had quantitative conservation goals since 1996, so this new requirement does not require any new initiative from the utility. It does, however, formalize the process for establishing conservation goals.

The MWL also reinforces the existing requirement that water utilities consider reclaimed water as a water supply option. While SPU's *2001 Water System Plan* contained a discussion of reclaimed water, this plan presents a more thorough analysis of potential, specific reclaimed water projects in its retail service area.

1.4.2 Regional Planning

SPU is committed to working together with other water providers and regional jurisdictions to address water issues.

This *2007 Water System Plan* is a regional plan that addresses the drinking water supply needs of about 70 percent of the population in King County plus a small population in Snohomish County. While the geographical extent of SPU's service area has not changed since the last plan, the relationships among regional water providers have changed.

Over the past few years, SPU has entered into new contracts with most of its wholesale customers that created stronger partnerships with some and created more autonomy for others. Of particular significance since the last water system plan was the formation of the Cascade Water Alliance (CWA). CWA has eight utility members, some of whom were once wholesale customers of SPU. Those individual utilities no longer have a direct relationship with SPU.

Due to the nature of the CWA contract, CWA, not SPU, now plans to meet the demands of its eight member utilities. The firm block, or fixed amount of water CWA purchases from SPU, is intended to provide water supply to CWA members until 2024, after which CWA anticipates that it will have other sources of supply and will gradually decrease its demand from the Seattle regional system. CWA is currently seeking its own supply options, including an intertie project with Tacoma, a project in which SPU no longer directly participates.

These new relationships have made regional coordination even more important in efficiently utilizing the region's water resources for people and instream resources. For this reason, SPU is investing significant staff time and sharing its planning tools in coordinated regional planning efforts, like that initiated by King County in 2005 and in the update of the *Central Puget Sound Regional Water Supply Outlook*, being developed by the Central Puget Sound Water Suppliers' Forum. SPU recognizes the importance of coordinating its efforts with other water providers within the region. SPU values information and efficiencies that can be obtained for all regional water users by coordinating with other providers and stakeholders.

1.4.3 Climate Change

Potential impacts from future climate change and year-to-year climate variability have been of increasing concern throughout the world, the country, the state, and locally. In response to this

SPU is preparing for the uncertainties and possible impacts of future climate change on the regional water supply system.

concern, studies are being conducted at all levels and on all aspects of potential impacts to water supply and demand. These studies produce varying results that make forecasts or projections of local impacts imprecise at best. SPU is nonetheless preparing for providing consistent, reliable, long-term water supply to the region even under this uncertainty.

SPU has been actively studying the possible impacts of climate change for more than 15 years. Planning efforts to meet future, long-term water demands are described in Chapter 2 of this *2007 Water System Plan*. While current analyses indicate that no new sources of drinking water will be needed to meet retail and wholesale water demand until after 2060, SPU continues to utilize scenario planning as a way to address the uncertainties surrounding how future climate change may impact the region. SPU's analytical capability has been significantly enhanced as the result of its use of a new, sophisticated water supply planning model that has increased SPU's confidence in its decisions. SPU has also developed and used adaptive management strategies to boost the system's operational flexibility and optimize existing supply to be more responsive to year-to-year climate variability.

1.5 PLAN ORGANIZATION

In 2005, SPU reorganized its water utility into the four business areas described previously. This *2007 Water System Plan* has been organized according to those business areas, except that the Major Watersheds business area activities are not required to appear in water system plans and, therefore, do not appear in this plan. The remaining chapters in Part I focus on each of the particular business areas, with Transmission and Distribution handled as separate chapters. Each of those chapters is divided into the following sections:

- A section summarizing the policies that determine direction for the business area. The policy section includes the context for each policy, shifts in policy direction, issues considered in development of the policy, and the policy statement itself.

- A service level section that identifies the service levels for that business area.

- A description of the facilities that business area manages, and the practices it follows in operating and maintaining those

facilities. This section focuses on changes since the *2001 Water System Plan*.

- A summary of needs, gaps, and issues that face that business area.

- A summary of the plans and actions the business area will be undertaking or continuing as it moves forward to address the needs, gaps, and issues.

Appendices to this plan are contained in a separate volume as listed in the Table of Contents. The organization of the appendices generally follows the chapters in this volume, and the appendices should be considered part of this *2007 Water System Plan.*

1.6 PLAN AND WAC REQUIREMENTS

Chapter 246-290-100 of the Washington Administrative Code (WAC) requires water purveyors having 1,000 or more services to prepare and submit a water system plan to WDOH. Purveyors must also update that plan every six years. According to the WAC, the purposes of such a plan are to:

- Demonstrate the system's operational, technical, managerial, and financial capability to achieve and maintain compliance with relevant local, state, and federal plans and regulations.

- Demonstrate how the system will address present and future needs in a manner consistent with other relevant plans and local, state, and federal laws, including applicable land use plans.

The contents of a water system plan are governed by WAC 246-290-100(4). Interim guidelines for implementing the MWL have also been used to develop this plan, as available. A checklist provided as an appendix lists the plan contents required by the WAC and identifies the specific chapters or appendices of this plan where that required information can be found.